

## 1. General description

Dual Silicon Carbide Schottky diode in a TO247 plastic package, designed for high frequency switched-mode power supplies.



**Lead-Free**

## 2. Features and benefits

- Highly stable switching performance
- Extremely fast reverse recovery time
- Superior in efficiency to Silicon Diode alternatives
- Reduced losses in associated MOSFET
- Reduced EMI
- Reduced cooling requirements
- RoHS compliant

## 3. Applications

- Power factor correction
- Telecom / Server SMPS
- UPS
- PV inverter
- PC Silverbox
- LED / OLED TV
- Motor Drives

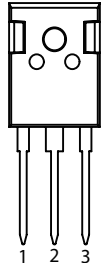
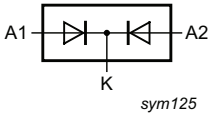
## 4. Quick reference data

Table 1. Quick reference data

| Symbol                  | Parameter                        | Conditions                                                                                                                                              | Notes | Values     |      |      | Unit |
|-------------------------|----------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------|-------|------------|------|------|------|
| Absolute maximum rating |                                  |                                                                                                                                                         |       |            |      |      |      |
| V <sub>RRM</sub>        | repetitive peak reverse voltage  |                                                                                                                                                         |       | 650        |      |      | V    |
| I <sub>O(AV)</sub>      | limiting average forward current | δ = 0.5 ; square-wave pulse; T <sub>mb</sub> ≤ 127 °C; both diodes conducting; <a href="#">Fig. 1</a> ; <a href="#">Fig. 2</a> ; <a href="#">Fig. 3</a> |       | 16         |      |      | A    |
| T <sub>j</sub>          | junction temperature             |                                                                                                                                                         |       | -55 to 175 |      |      | °C   |
| Symbol                  | Parameter                        | Conditions                                                                                                                                              | Notes | Min        | Typ  | Max  | Unit |
| Static characteristics  |                                  |                                                                                                                                                         |       |            |      |      |      |
| V <sub>F</sub>          | forward voltage                  | I <sub>F</sub> = 8 A; T <sub>j</sub> = 25 °C; per diode; <a href="#">Fig. 5</a>                                                                         |       | -          | 1.45 | 1.70 | V    |
|                         |                                  | I <sub>F</sub> = 8 A; T <sub>j</sub> = 150 °C; per diode; <a href="#">Fig. 5</a>                                                                        |       | -          | 1.80 | 2.20 | V    |
| Dynamic characteristics |                                  |                                                                                                                                                         |       |            |      |      |      |
| Q <sub>r</sub>          | recovered charge                 | I <sub>F</sub> = 8 A; dI <sub>F</sub> /dt = 500 A/μs; V <sub>R</sub> = 400 V; T <sub>j</sub> = 25 °C; per diode; <a href="#">Fig. 7</a>                 |       | -          | 12   | -    | nC   |

## 5. Pinning information

Table 2. Pinning information

| Pin | Symbol | Description                         | Simplified outline                                                                | Graphic symbol                                                                      |
|-----|--------|-------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| 1   | A1     | anode                               |  |  |
| 2   | K      | cathode                             |                                                                                   |                                                                                     |
| 3   | A2     | anode                               |                                                                                   |                                                                                     |
| mb  | mb     | mounting base; connected to cathode |                                                                                   |                                                                                     |

## 6. Ordering information

Table 3. Ordering information

| Type number   | Package name | Orderable part number | Packing method | Small packing quantity | Package version | Package issue date |
|---------------|--------------|-----------------------|----------------|------------------------|-----------------|--------------------|
| WNSC5D16650CW | TO247        | WNSC5D16650CW6Q       | Tube           | 30                     | TO247N          | 20-July-2016       |

## 7. Marking

Table 4. Marking codes

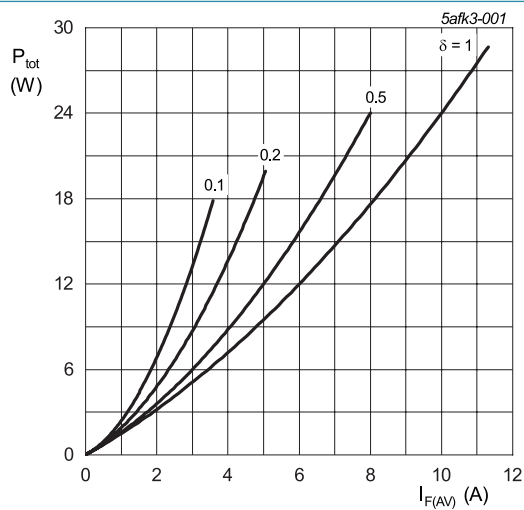
| Type number   | Marking codes     |
|---------------|-------------------|
| WNSC5D16650CW | WNSC5D<br>16650CW |

## 8. Limiting values

**Table 5. Limiting values**

In accordance with the Absolute Maximum Rating System (IEC 60134).

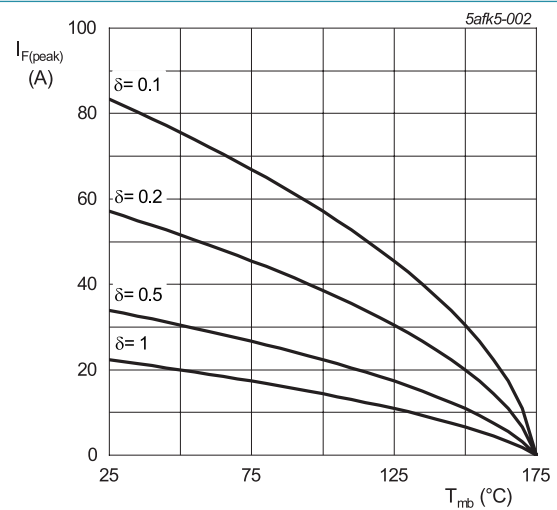
| Symbol      | Parameter                           | Conditions                                                                                                           | Notes | Values     | Unit                 |
|-------------|-------------------------------------|----------------------------------------------------------------------------------------------------------------------|-------|------------|----------------------|
| $V_{RRM}$   | repetitive peak reverse voltage     |                                                                                                                      |       | 650        | V                    |
| $V_{RWM}$   | crest working reverse voltage       |                                                                                                                      |       | 650        | V                    |
| $V_R$       | reverse voltage                     | DC                                                                                                                   |       | 650        | V                    |
| $I_{O(AV)}$ | limiting average forward current    | $\delta = 0.5$ ; square-wave pulse; $T_{mb} \leq 127^\circ\text{C}$ ; both diodes conducting; Fig. 1; Fig. 2; Fig. 3 |       | 16         | A                    |
| $I_{FRM}$   | repetitive peak forward current     | $\delta = 0.5$ ; $t_p = 25\ \mu\text{s}$ ; $T_{mb} \leq 131^\circ\text{C}$ ; square-wave pulse; per diode            |       | 16         | A                    |
| $I_{FSM}$   | non-repetitive peak forward current | $t_p = 10\ \text{ms}$ ; $T_{j(\text{init})} = 25^\circ\text{C}$ ; sine-wave pulse; per diode                         |       | 48         | A                    |
|             |                                     | $t_p = 10\ \mu\text{s}$ ; $T_{j(\text{init})} = 25^\circ\text{C}$ ; square-wave pulse; per diode                     |       | 420        | A                    |
| $I^2t$      | $I^2t$ for fusing                   | sine-wave pulse; $T_{j(\text{init})} = 25^\circ\text{C}$ ; $t_p = 10\ \text{ms}$                                     |       | 11.52      | $\text{A}^2\text{s}$ |
| $T_{stg}$   | storage temperature                 |                                                                                                                      |       | -55 to 175 | $^\circ\text{C}$     |
| $T_j$       | junction temperature                |                                                                                                                      |       | -55 to 175 | $^\circ\text{C}$     |



$$I_{F(AV)} = I_{F(RMS)} \times \sqrt{\delta}$$

$$V_o = 1.395\ \text{V}; R_s = 0.1006\ \Omega$$

**Fig. 1. Forward power dissipation as a function of average forward current; square waveform; maximum values; per diode**



**Fig. 2. Current derating as a function of mounting base temperature; per diode**

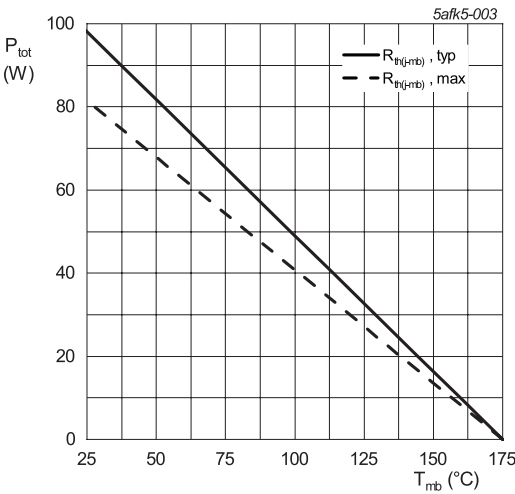


Fig. 3. Total power dissipation as a function of mounting base temperature; per diode

9. Thermal characteristics

Table 6. Thermal characteristics

| Symbol         | Parameter                                            | Conditions                        | Notes | Min | Typ  | Max  | Unit |
|----------------|------------------------------------------------------|-----------------------------------|-------|-----|------|------|------|
| $R_{th(j-mb)}$ | thermal resistance from junction to mounting base    | per diode; <a href="#">Fig. 4</a> |       | -   | 1.53 | 1.84 | K/W  |
|                |                                                      | both diodes conducting            |       | -   | 0.79 | 1    | K/W  |
| $R_{th(j-a)}$  | thermal resistance from junction to ambient free air | in free air                       |       | -   | 50   | -    | K/W  |

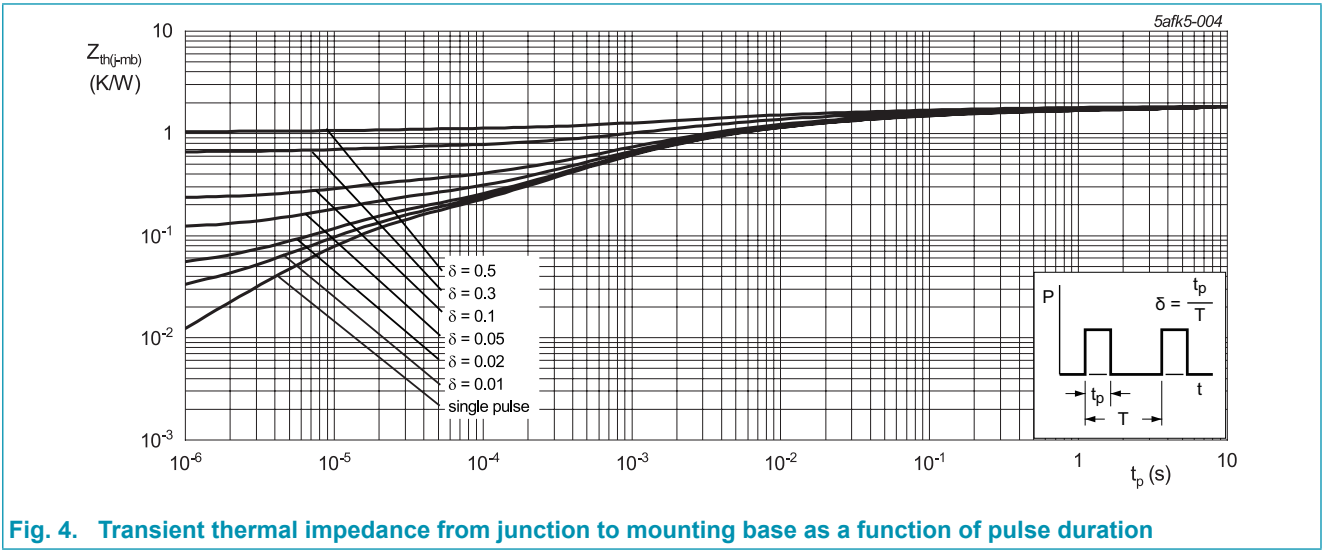
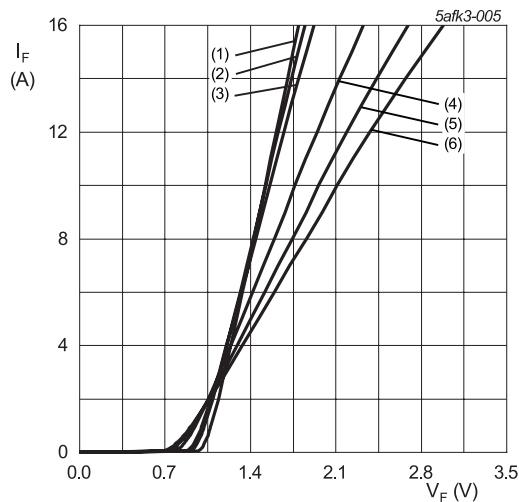


Fig. 4. Transient thermal impedance from junction to mounting base as a function of pulse duration

## 10. Characteristics

Table 7. Characteristics

| Symbol                  | Parameter                       | Conditions                                                                                                                              | Notes | Min | Typ  | Max  | Unit |
|-------------------------|---------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------|-------|-----|------|------|------|
| Static characteristics  |                                 |                                                                                                                                         |       |     |      |      |      |
| V <sub>F</sub>          | forward current                 | I <sub>F</sub> = 8 A; T <sub>j</sub> = 25 °C; per diode; <a href="#">Fig. 5</a>                                                         |       | -   | 1.45 | 1.70 | V    |
|                         |                                 | I <sub>F</sub> = 8 A; T <sub>j</sub> = 150 °C; per diode; <a href="#">Fig. 5</a>                                                        |       | -   | 1.80 | 2.20 | V    |
|                         |                                 | I <sub>F</sub> = 8 A; T <sub>j</sub> = 175 °C; per diode; <a href="#">Fig. 5</a>                                                        |       | -   | 2.00 | 2.30 | V    |
| I <sub>R</sub>          | reverse current                 | V <sub>R</sub> = 650 V; T <sub>j</sub> = 25 °C; per diode; <a href="#">Fig. 6</a>                                                       |       | -   | 0.4  | 40   | μA   |
|                         |                                 | V <sub>R</sub> = 650 V; T <sub>j</sub> = 175 °C; per diode; <a href="#">Fig. 6</a>                                                      |       | -   | 20   | 200  | μA   |
| Dynamic characteristics |                                 |                                                                                                                                         |       |     |      |      |      |
| Q <sub>r</sub>          | recovered charge                | I <sub>F</sub> = 8 A; V <sub>R</sub> = 400 V; dI <sub>F</sub> /dt = 500 A/μs; T <sub>j</sub> = 25 °C; per diode; <a href="#">Fig. 7</a> |       | -   | 12   | -    | nC   |
| C <sub>d</sub>          | diode capacitance               | f = 1 MHz; V <sub>R</sub> = 1 V; T <sub>j</sub> = 25 °C; per diode                                                                      |       | -   | 267  | -    | pF   |
|                         |                                 | f = 1 MHz; V <sub>R</sub> = 300 V; T <sub>j</sub> = 25 °C; per diode                                                                    |       | -   | 32   | -    | pF   |
|                         |                                 | f = 1 MHz; V <sub>R</sub> = 600 V; T <sub>j</sub> = 25 °C; per diode                                                                    |       | -   | 31   | -    | pF   |
| E <sub>as</sub>         | non-repetitive avalanche energy | I <sub>R</sub> = 4.2 A; L = 5 mH; T <sub>j(</sub> init) = 25 °C; per diode                                                              |       | 45  | -    | -    | mJ   |



$V_o = 1.395\text{ V}$ ;  $R_s = 0.1006\text{ }\Omega$

- (1)  $T_J = -55\text{ °C}$ ; typical values
- (2)  $T_J = 0\text{ °C}$ ; typical values
- (3)  $T_J = 25\text{ °C}$ ; typical values
- (4)  $T_J = 100\text{ °C}$ ; typical values
- (5)  $T_J = 150\text{ °C}$ ; typical values
- (6)  $T_J = 175\text{ °C}$ ; typical values

Fig. 5. Forward current as a function of forward voltage; typical values; per diode

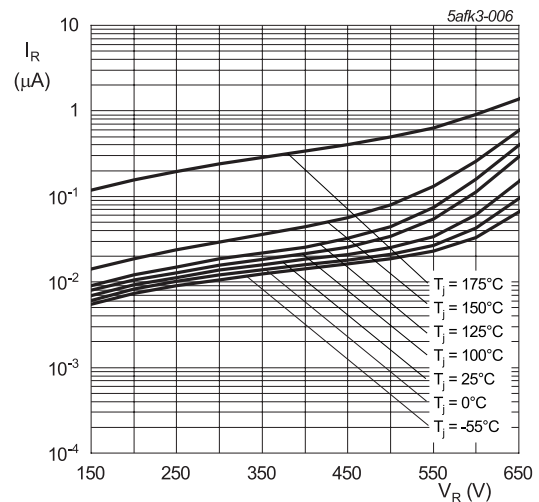


Fig. 6. Reverse leakage current as a function of reverse voltage; typical value; per diode

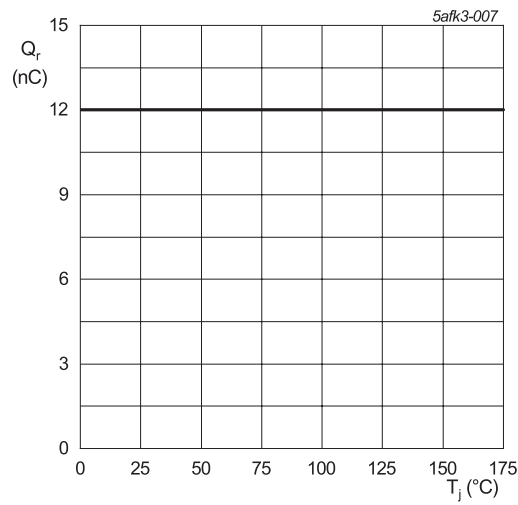
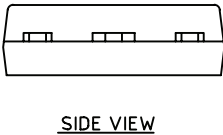
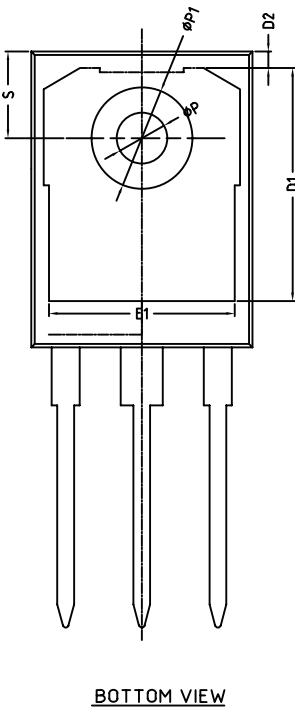
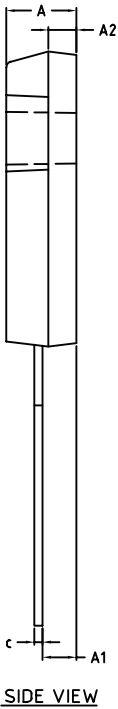
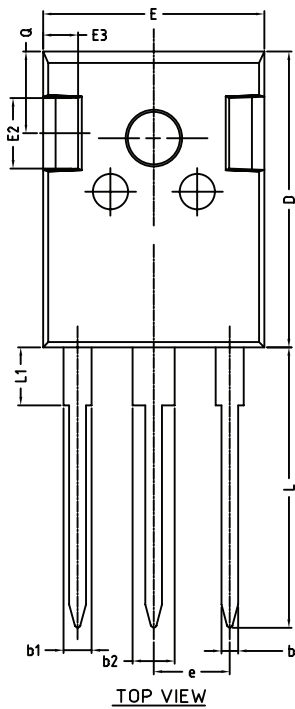


Fig. 7. Recovered charge as a function of junction temperature; per diode

11. Package outline

Plastic single-ended through-hole package; heatsink mounted; 1 mounting hole; 3-lead TO-247

SOT429N



| UNIT | A   | A1   | A2   | b    | b1   | b2   | c    | D    | D1    | D2    | E    | E1    | E2    | E3   | e    | L     | L1   | P    | P1   | Q    | S    |
|------|-----|------|------|------|------|------|------|------|-------|-------|------|-------|-------|------|------|-------|------|------|------|------|------|
| mm   | MAX | 5.20 | 2.60 | 2.10 | 1.40 | 2.20 | 3.20 | 0.70 | 21.10 | 16.85 | 1.35 | 15.90 | 13.50 | 5.20 | 2.60 | 20.10 | 4.75 | 3.70 | 7.40 | 6.00 | 6.25 |
|      | NOM |      |      |      |      |      |      |      |       |       |      |       |       |      |      |       |      |      |      |      |      |
|      | MIN | 4.70 | 2.20 | 1.90 | 1.00 | 1.80 | 2.80 | 0.50 | 20.90 | 16.25 | 1.05 | 15.70 | 13.10 | 4.80 | 2.40 | 19.80 | -    | 3.50 | -    | 5.60 | 6.05 |

| OUTLINE<br>VERSION | REFERENCES |        |       |  | PROJECTION | ISSUE DATE |
|--------------------|------------|--------|-------|--|------------|------------|
|                    | IEC        | JEDEC  | EIA J |  |            |            |
| SOT429N            |            | TO-247 |       |  |            |            |

## 12. Legal information

### Data sheet status

| Document status [1][2]         | Product status [3] | Definition                                                                            |
|--------------------------------|--------------------|---------------------------------------------------------------------------------------|
| Objective [short] data sheet   | Development        | This document contains data from the objective specification for product development. |
| Preliminary [short] data sheet | Qualification      | This document contains data from the preliminary specification.                       |
| Product [short] data sheet     | Production         | This document contains the product specification.                                     |

- [1] Please consult the most recently issued document before initiating or completing a design.
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